Kodiak, Alaska Site 1 Wind Resource Report

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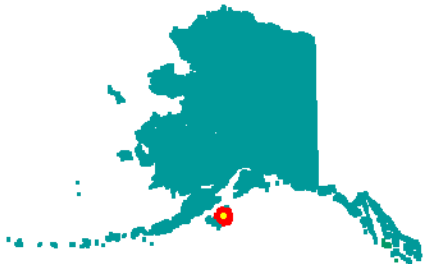
Date of report: March 16, 2007

Photo by Doug Vaught, V3 Energy LLC



Summary Information

Pillar Mountain has superb potential for wind power development with Class 7 wind power density, very low wind shear, seasonally directional winds, and low turbulence. A significant construction advantage of this site is that the underlying ground is mostly solid rock.

Meteorological Tower Data Synopsis

Wind power class (measured to date)	Class 7 – Superb
Average wind speed (30 meters)	7.85 m/s (at 30 meters)
Maximum wind speed (2 sec average)	47.7 m/s, 3/9/06, 7:30 am (30 m level)
Mean wind power density (50 meters)	994 W/m^2 (predicted by calculation)
Mean wind power density (30 meters)	886 W/m^2
Roughness Class	0.55 (snow surface)
Power law exponent	0.101 (low wind shear)
Turbulence Intensity (30 meters)	0.122
Data start date	November 2, 2005
Most recent data date	February 27, 2007

Community Profile

Current Population: 6,088 (2005 State Demographer est.)
Pronunciation/Other Names: (KOH-dee-ack); includes Shoonaq'
Incorporation Type: Home Rule City
Borough Located In: Kodiak Island Borough
School District: Kodiak Island Borough School District
Regional Native Corporation: Koniag, Incorporated

Location:

Kodiak is located near the north eastern tip of Kodiak Island in the Gulf of Alaska. Kodiak Island, "the emerald isle," is the largest island in Alaska, and is second only to Hawaii in the U.S. Kodiak National Wildlife Refuge encompasses nearly 1.9 million acres on Kodiak and Afognak Islands. It is 252 air miles south of Anchorage, a 45-minute flight, and is a 4-hour flight from Seattle. It lies at approximately 57.788890° North Latitude and -152.401900° West Longitude. (Sec. 32, T027S, R019W, Seward Meridian.) Kodiak is located in the Kodiak Recording District. The area encompasses 3.5 sq. miles of land and 1.4 sq. miles of water.

Facilities:

Pillar Creek and Monashka Creek Reservoirs provide water, which is stored and distributed by pipe throughout the area. Piped sewage is processed in a treatment plant. All homes are fully plumbed. The piped system has been expanded to Miller Point and Spruce Cape, to replace individual wells and septic tanks in those areas. Refuse collection services are provided by the Borough. The landfill is located 6 miles north of the City, at Monashka Bay. Kodiak Electric Association, a cooperative utility, operates and purchases power from the Four Dam Pool-owned Terror Lake Hydroelectric Facility. It also operates a Coast Guard-owned plant, and owns three additional diesel-powered plants at Swampy Acres, Kodiak and Port Lions.

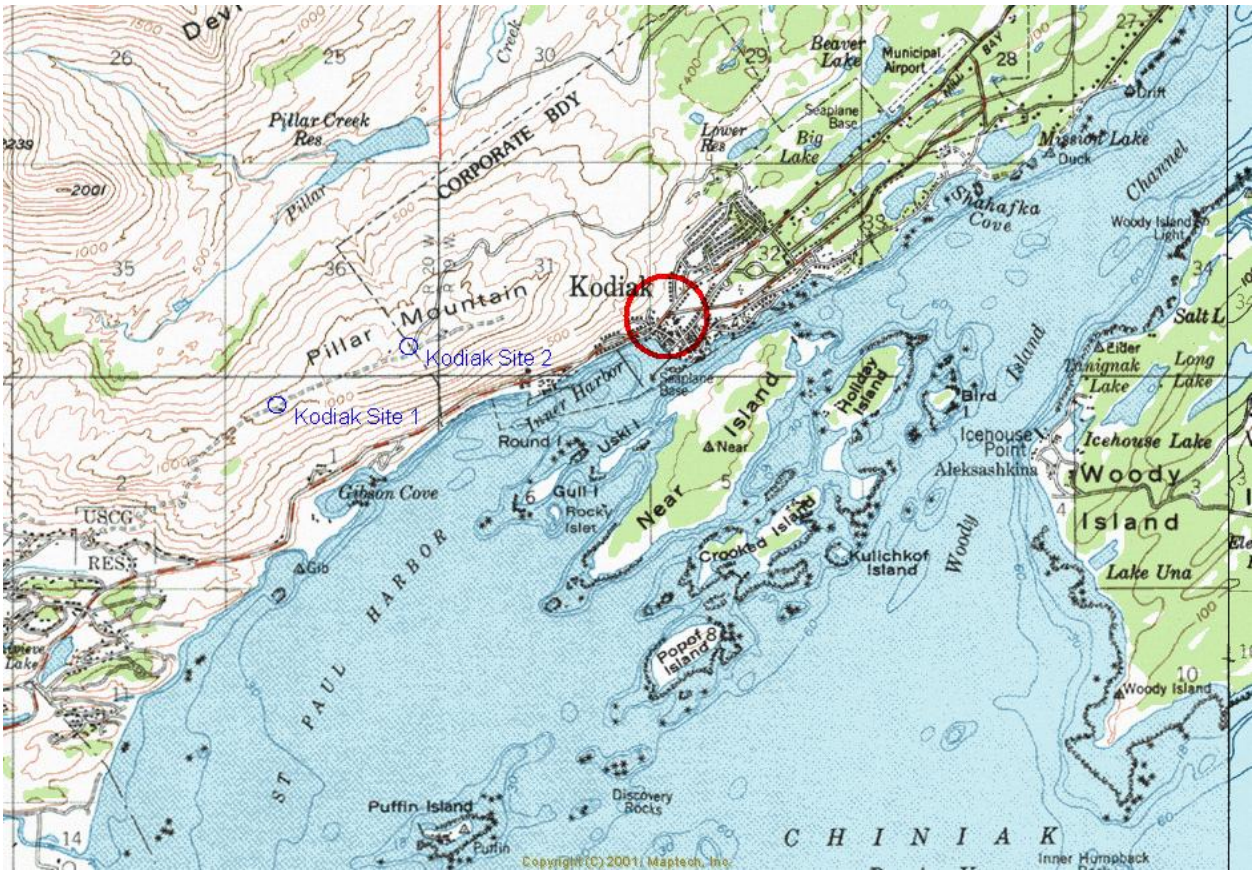
Climate:

The climate of the Kodiak Islands has a strong marine influence. There is little or no freezing weather, moderate precipitation, occasional high winds, and frequent cloud cover and fog. Severe storms are common from December through February. Annual rainfall is 67 inches, and snowfall averages 78 inches. January temperatures range from 14 to 46 F; July temperatures vary from 39 to 76 F.

(Above information from State of Alaska Department of Commerce, Community, and Economic Development website, www.dced.state.ak.us).

Site Information and Location

Site number	7309
Site Description	Kodiak, Alaska, Pillar Mountain ridgeline
Latitude/longitude	N 057° 47.008'; W 152° 27.464'
Site elevation	325 meters
Datalogger type	NRG Symphonie
Tower type	NRG 30-meter Tall Tower, 152 mm (6 in) diameter



Met Tower Sensor Information

Channel	Sensor type	Height	Multiplier	Offset	Orientation
1	NRG #40 anemometer	30 m (A)	0.765	0.35	east
2	NRG #40 anemometer	30 m (B)	0.765	0.35	south
3	NRG #40 anemometer	20 m	0.765	0.35	southeast
7	NRG #200P wind vane	30 m	0.351	165	NNW
9	NRG #110S Temp C	2 m	0.138	-86.383	N/A

Data Quality Control Summary

Data was filtered to remove presumed icing events that yield false zero wind speed data. Data that met the following criteria were filtered: wind speed < 1 m/s, wind speed standard deviation = 0, and temperature < 2° C and other data obviously compromised by icing events. As one would expect, data recovery during the summer months was 100%, with data loss due to icing in winter. For this wind resource report, data was synthesized to replace data lost due to icing.

		Ch 1 - 30 m (A)		Ch 2 - 30 m (B)		Ch 3 - 20 m	
Year	Month	Records	Recovery Rate (%)	Records	Recovery Rate (%)	Records	Recovery Rate (%)
2005	Nov	3,991	97.6	3,989	97.5	3,995	97.7
2005	Dec	4,412	98.8	4,412	98.8	4,414	98.9
2006	Jan	4,394	98.4	4,390	98.3	4,365	97.8
2006	Feb	3,946	97.9	3,946	97.9	3,947	97.9
2006	Mar	4,282	95.9	4,192	93.9	4,288	96.1
2006	Apr	4,129	95.6	4,152	96.1	4,167	96.5
2006	May	4,459	99.9	4,445	99.6	4,461	99.9
2006	Jun	4,320	100	4,320	100	4,320	100
2006	Jul	4,464	100	4,464	100	4,464	100
2006	Aug	4,464	100	4,464	100	4,464	100
2006	Sep	4,320	100	4,320	100	4,320	100
2006	Oct	4,464	100	4,464	100	4,464	100
2006	Nov	4,320	100	4,320	100	4,320	100
2006	Dec	4,278	95.8	4,398	98.5	4,464	100
2007	Jan	3,977	89.1	4,099	91.8	4,186	93.8
2007	Feb	3,804	100	3,762	98.9	3,762	98.9
All data		68,024	98.0	68,137	98.2	68,401	98.6

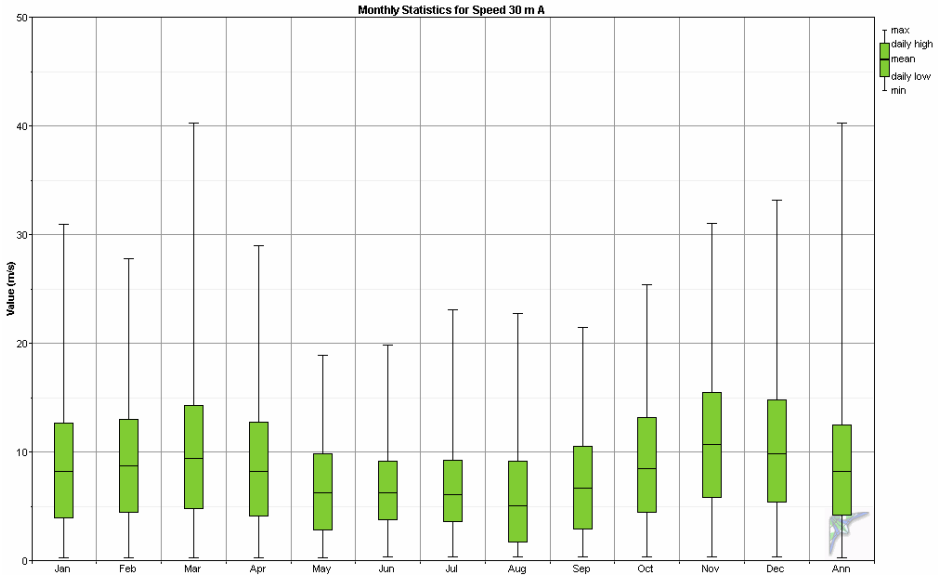
		Ch 7 - vane		Ch 9 - temperature	
Year	Month	Records	Recovery Rate (%)	Records	Recovery Rate (%)
2005	Nov	3,836	93.8	4,091	100
2005	Dec	4,412	98.8	4,464	100
2006	Jan	4,151	93.0	4,464	100
2006	Feb	3,823	94.8	4,032	100
2006	Mar	4,039	90.5	4,464	100
2006	Apr	4,061	94.0	4,320	100
2006	May	4,445	99.6	4,464	100
2006	Jun	4,320	100	4,320	100
2006	Jul	4,464	100	4,464	100
2006	Aug	4,464	100	4,464	100
2006	Sep	4,320	100	4,320	100
2006	Oct	4,384	98.2	4,464	100
2006	Nov	4,187	96.9	4,320	100
2006	Dec	4,181	93.7	4,464	100
2007	Jan	3,965	88.8	4,464	100
2007	Feb	3,804	100	3,804	100
All data		66,856	96.4	69,383	100

Measured Wind Speeds

The 30 meter (A) anemometer wind speed average for the reporting period is 7.85 m/s, the 30 meter (B) anemometer wind speed average is 7.73 m/s, and the 20 meter anemometer wind speed average is 7.47 m/s. The wind speed average for the 60-meter height synthesized anemometer level (a virtual anemometer) is 8.31 m/s. Because of the relatively low shear at this site, the 60 m average (virtual) wind speed is only about six percent greater than the wind speed at 30 meters. Note that the maximum wind speed data represent ten-minute average measurements.

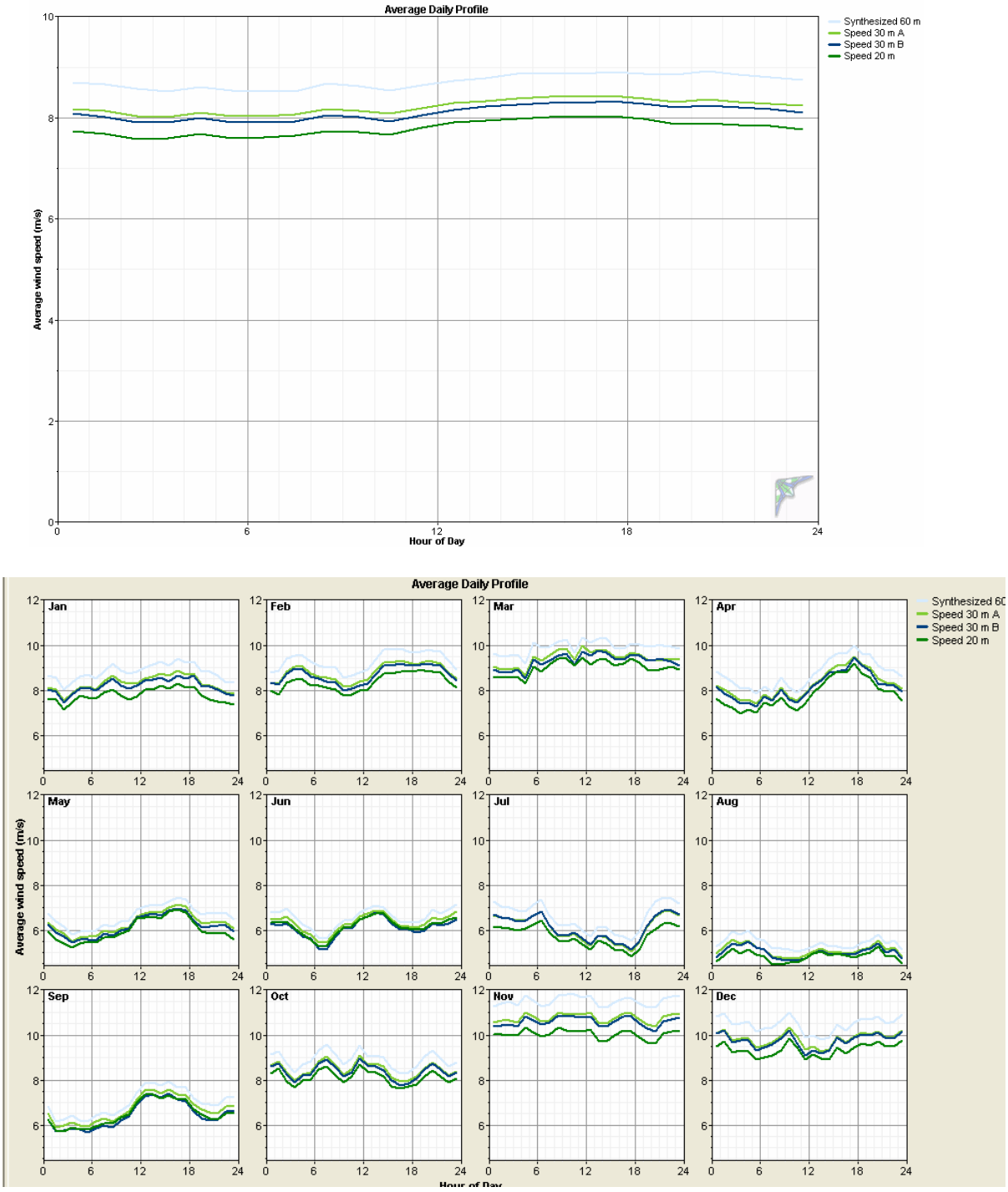
Wind Speed Summary

	60 m virtual speed		30 m (A) speed		30 m (B) speed		20 m speed	
Month	*Mean (m/s)*	*Max (m/s)*	Mean (m/s)	Max (m/s)	Mean (m/s)	Max (m/s)	Mean (m/s)	Max (m/s)
Jan	*8.81*	*33.3*	8.28	31.0	8.17	31.2	7.76	29.9
Feb	*9.29*	*26.2*	8.79	26.2	8.68	25.6	8.35	26.2
Mar	*9.91*	*40.7*	9.41	40.3	9.29	40.7	9.01	40.4
Apr	*8.73*	*31.6*	8.23	29.0	8.12	29.0	7.82	29.2
May	*6.61*	*21.1*	6.28	18.9	6.17	19.2	5.99	18.4
Jun	*6.56*	*22.7*	6.31	19.9	6.1	20.3	6.16	18.8
Jul	*6.57*	*24.6*	6.08	23.1	6.12	22.9	5.74	22.6
Aug	*5.41*	*23.2*	5.1	22.8	5.01	22.5	4.84	22.7
Sep	*6.98*	*24.4*	6.68	21.5	6.42	21.8	6.47	20.3
Oct	*8.91*	*27.4*	8.46	25.4	8.38	25.3	8.12	24.6
Nov	*11.51*	*33.4*	10.75	29.8	10.6	29.6	10.04	29.5
Dec	*10.47*	*33.8*	9.83	33.2	9.74	33.1	9.34	32.8
Annual	***8.31***	*40.7*	**7.85**	40.3	**7.73**	40.7	**7.47**	40.4



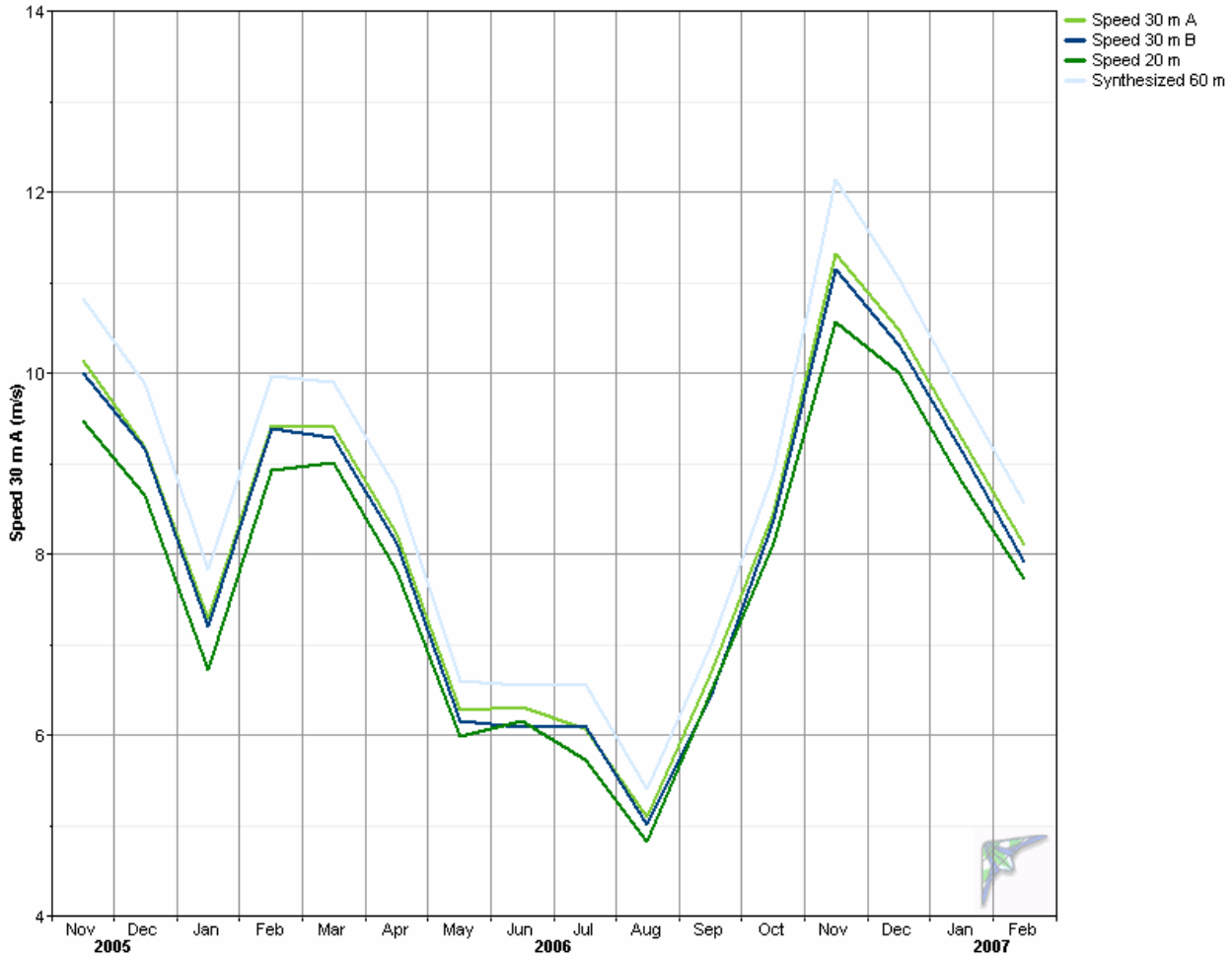
Daily wind profile

The daily wind profile indicates that the lowest wind speeds of the day occur in the morning hours of 2 to 11 a.m. and the highest wind speeds of the day occur during the afternoon and evening hours of 2 to 10 p.m. The daily variation of wind speed is quite minimal on an annual basis, but as shown below, more pronounced on a monthly basis.



Time Series of Wind Speed Monthly Averages

As expected, the highest winds occurred during the fall through spring months with relatively light winds during the summer months of May through August. The unusually low winds measured in January 2006 were due to a persistent high pressure system over Alaska that month that resulted in relatively calm winds and extremely cold temperatures Statewide. Note that measured winds during winter 2006/2007 are notably higher than during winter 2005/2006.

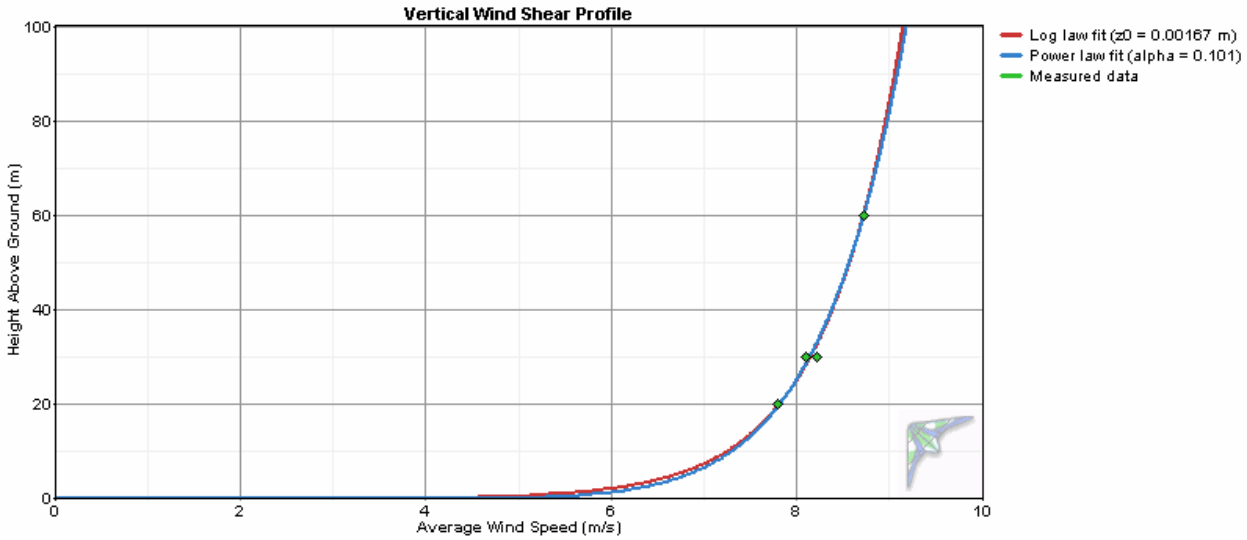


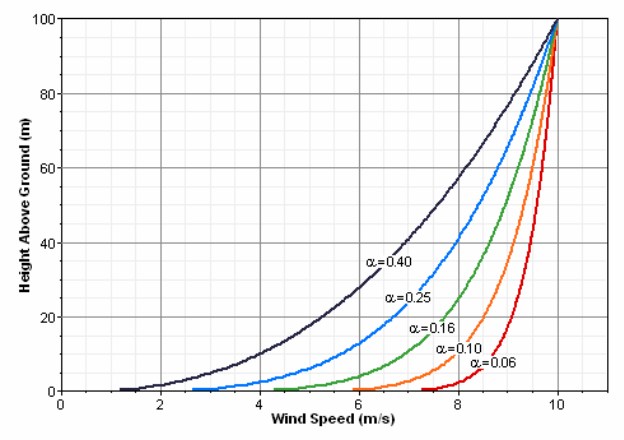
Excess wind speed

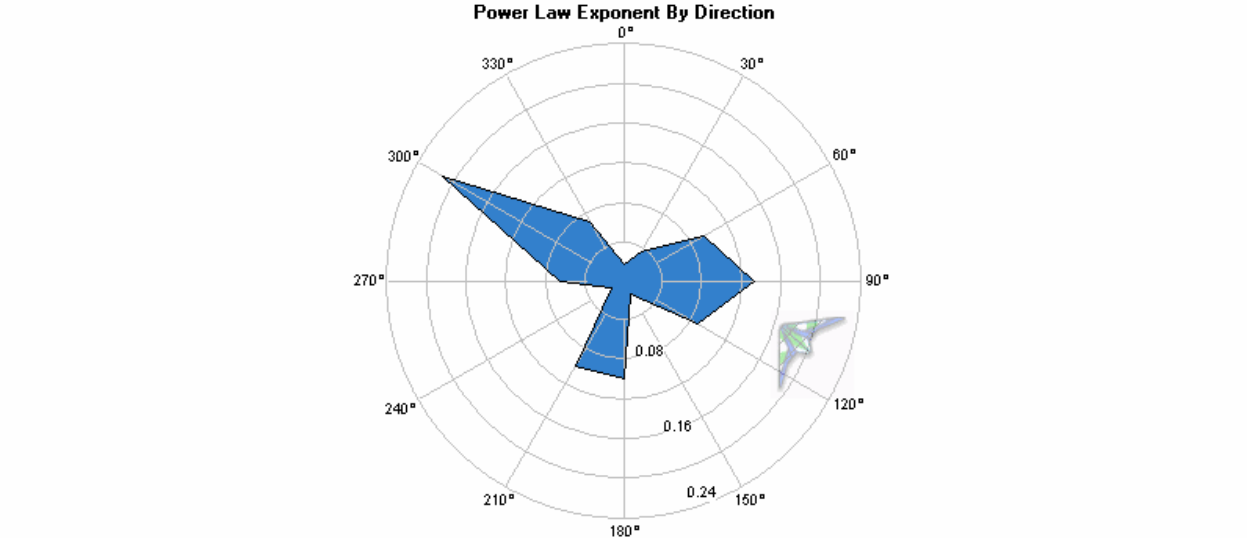
Most wind turbines have a cut-out speed of 25 m/s, or more precisely, cut-out when the 10 minute average wind speed exceeds 25 m/s. Given the powerful wind resources on Pillar Mountain, one could expect occasional high wind speed shut downs of turbines. During a 455 day period (November 2, 2005 to January 31, 2007), there were 1030 ten minute periods or 172 hours where predicted wind speeds at 60 meters elevation (using the *virtual* anemometer) exceeded 25 m/s. This represents 1.57 percent of the time. Note however that turbines will not immediately restart once ten minute average wind speeds dip below 25 m/s and hence the lost production time due to high winds would be higher than the calculated 1.57 percent. This should be discussed with turbine manufacturers.

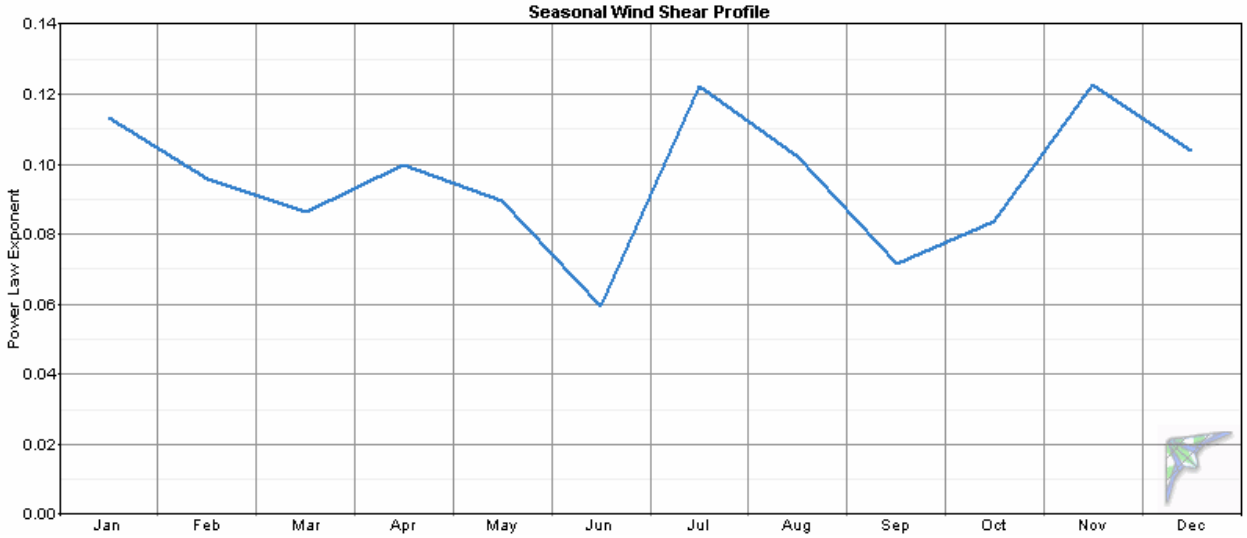
Wind Shear Profile

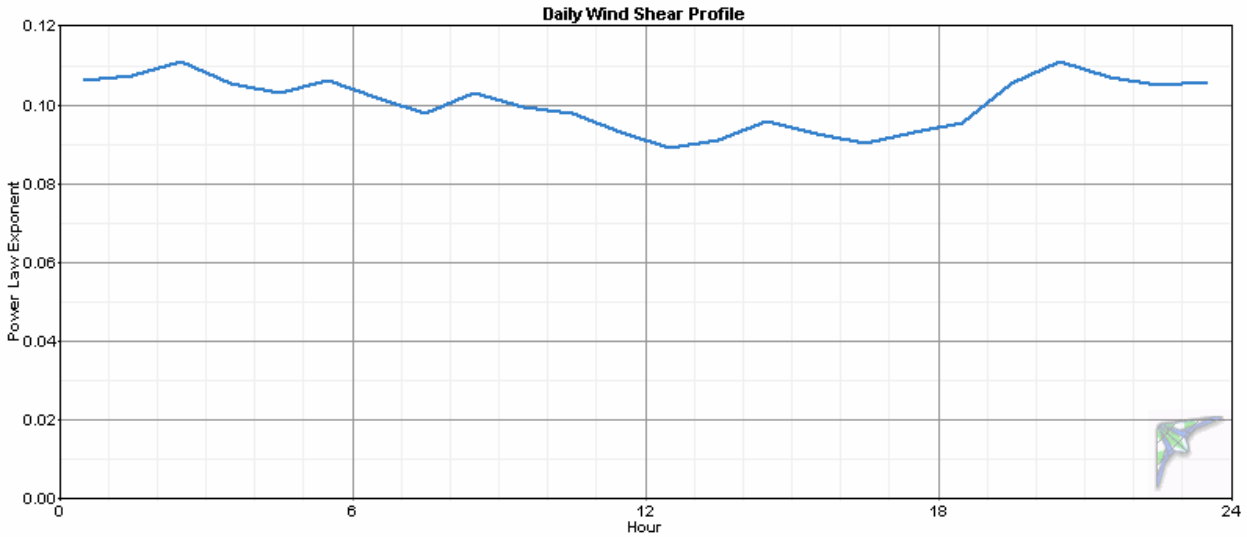
The average power law exponent was calculated at 0.101 with a virtual anemometer at 60 meters, or measured at 0.112 without it, indicating low wind shear at Site 1. The practical application of this information is that a low turbine tower height is advisable as there is not a significant marginal gain in average wind speed with height. Other graphs show the variability of wind shear by direction and seasonal and daily variability.





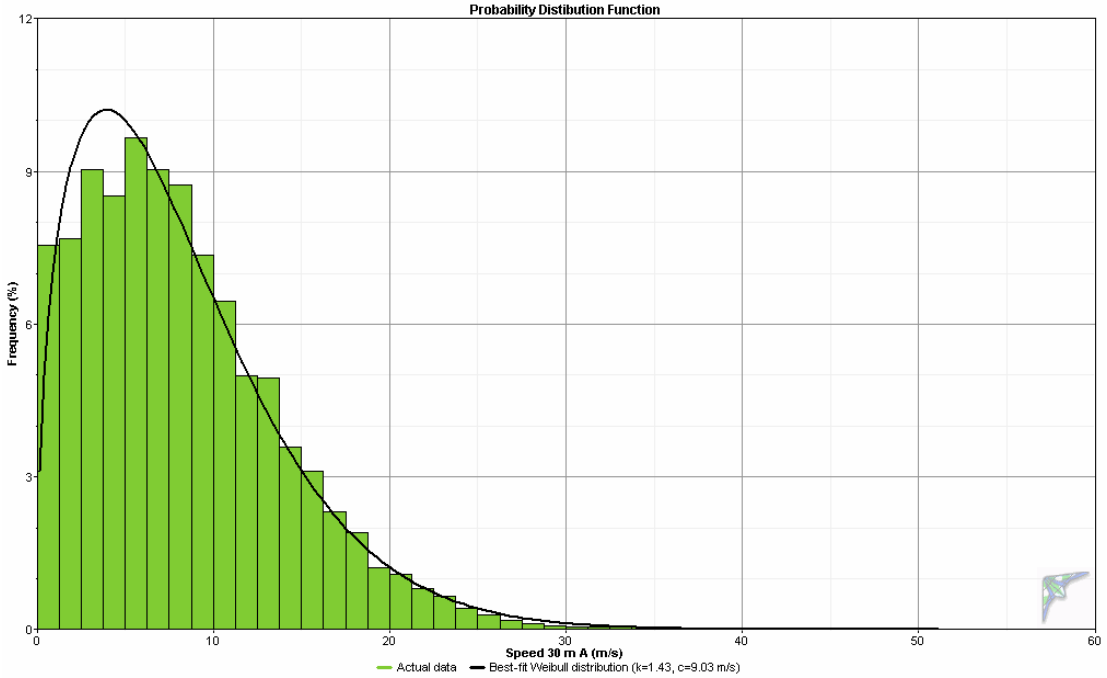

Power Law Exponent By Direction
0°
30°
60°
90°
120°
150°
180°
210°
240°
270°
300°
330°
0.08
0.16
0.24

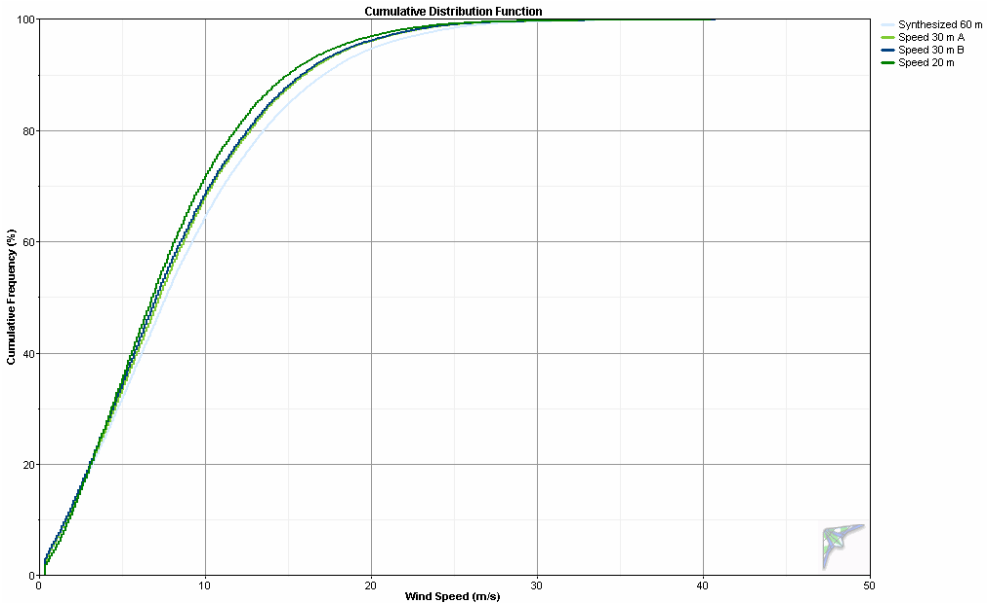

Seasonal Wind Shear Profile
Power Law Exponent
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec


Daily Wind Shear Profile
Power Law Exponent
0.12
0.10
0.08
0.06
0.04
0.02
0.00
0
6
12
18
24
Hour

Probability Distribution Function

The probability distribution function provides a visual indication of measured wind speeds in one meter per second "bins". Note that most wind turbines do not begin to generate power until the wind speed at hub height reaches 3.5 to 4 m/s, also known as the "cut-in" wind speed. The black line in the graph is a best fit Weibull distribution. At the 30 meter level, Weibull parameters are k = 1.43 (indicates a broad distribution of wind speeds) and c = 9.03 m/s (scale factor for the Weibull distribution) for the measurement period of 11/2/2005 to 2/27/2007. At 20 meters, k = 1.48 and c = 8.63 m/s for the same measurement period.

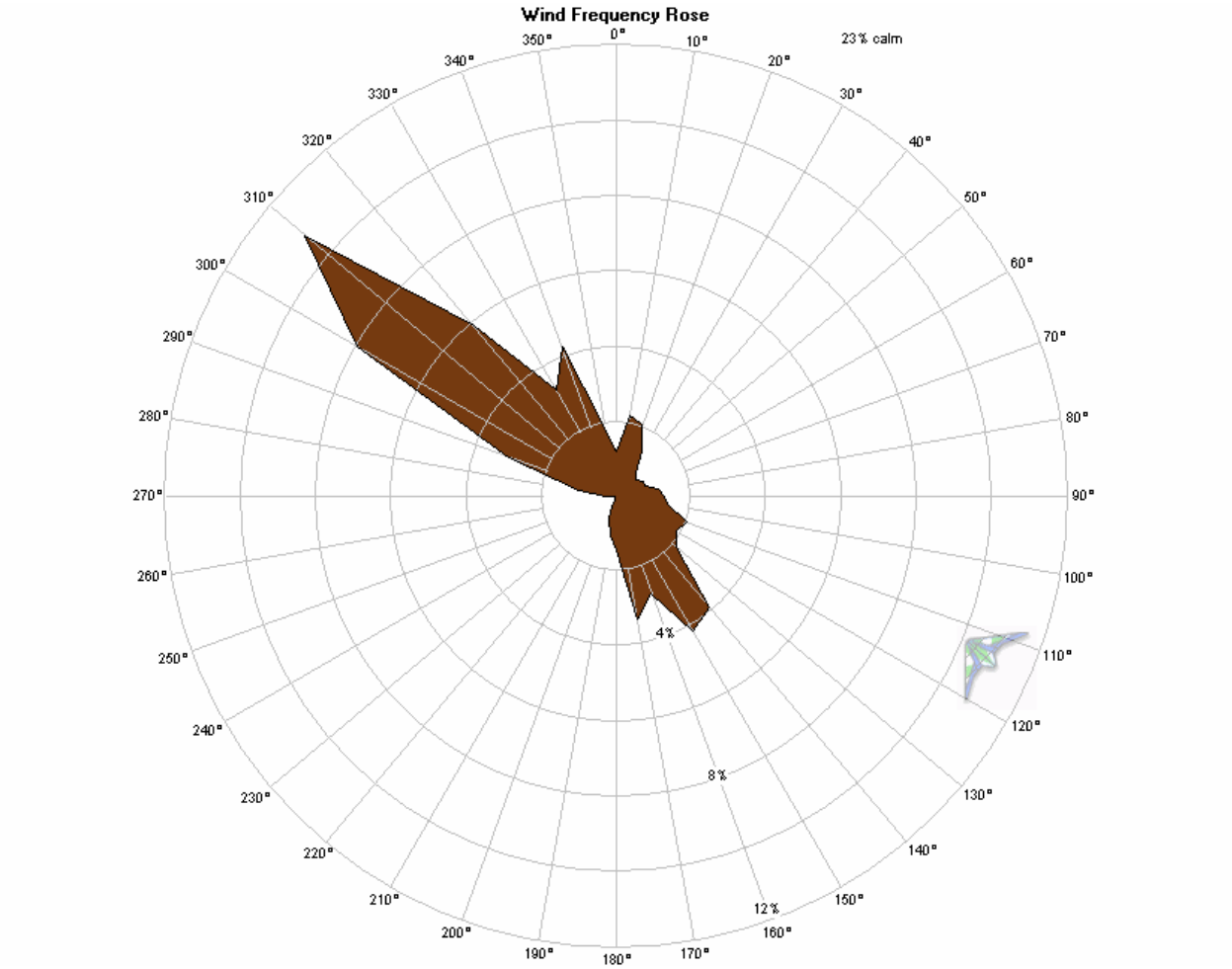




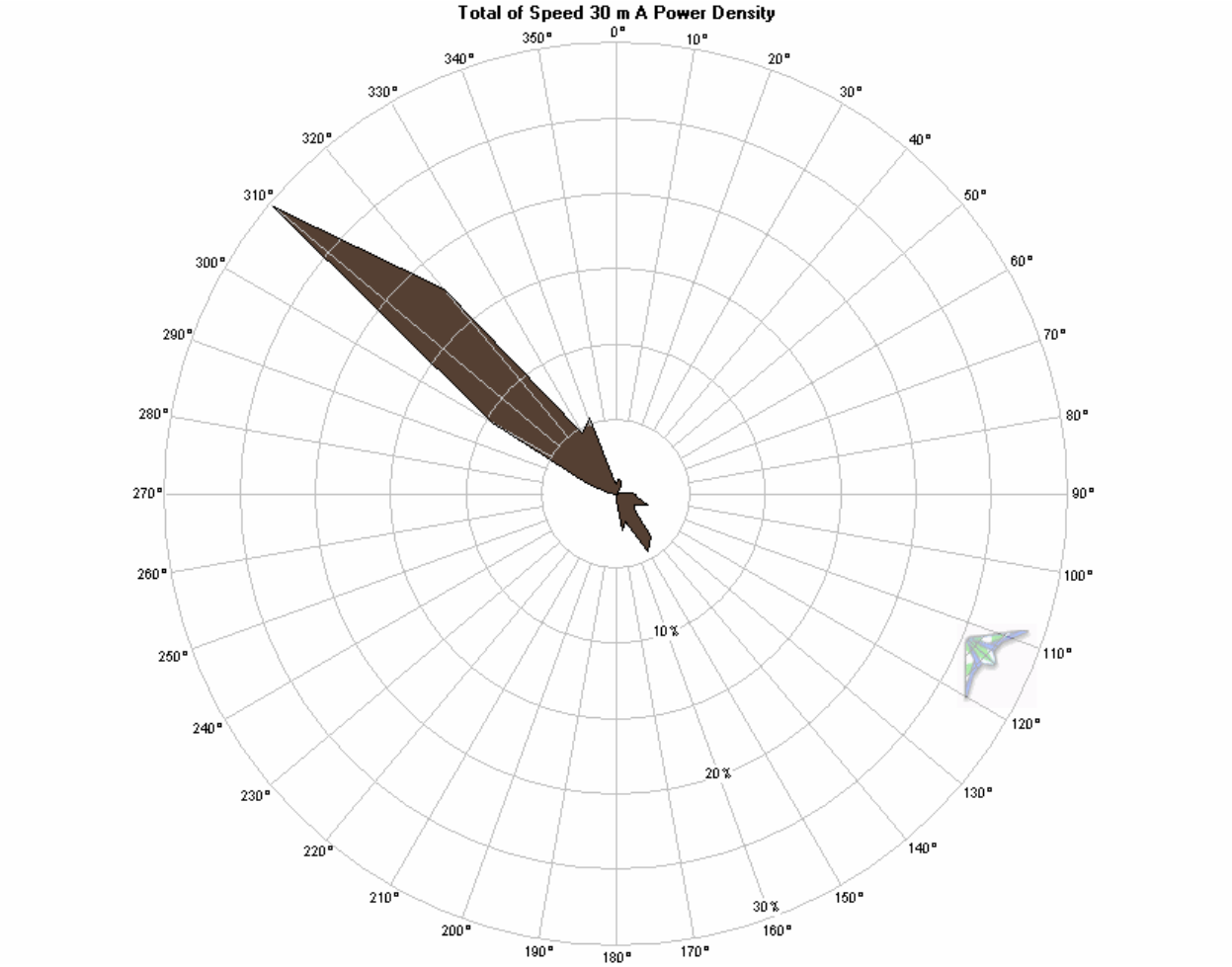
Wind Roses

Kodiak Site 1 winds are strongly directional; the wind frequency rose indicates predominately northwest winds with a lesser component of south-southeast winds. This data observation is even stronger when one considers the power density rose (second wind rose). As one can see, the power producing winds are almost entirely concentrated in one ten-degree sector centered on northwest. The practical application of this information is that several turbines can potentially be spaced closely together perpendicular to the prevailing NW and SSE winds.

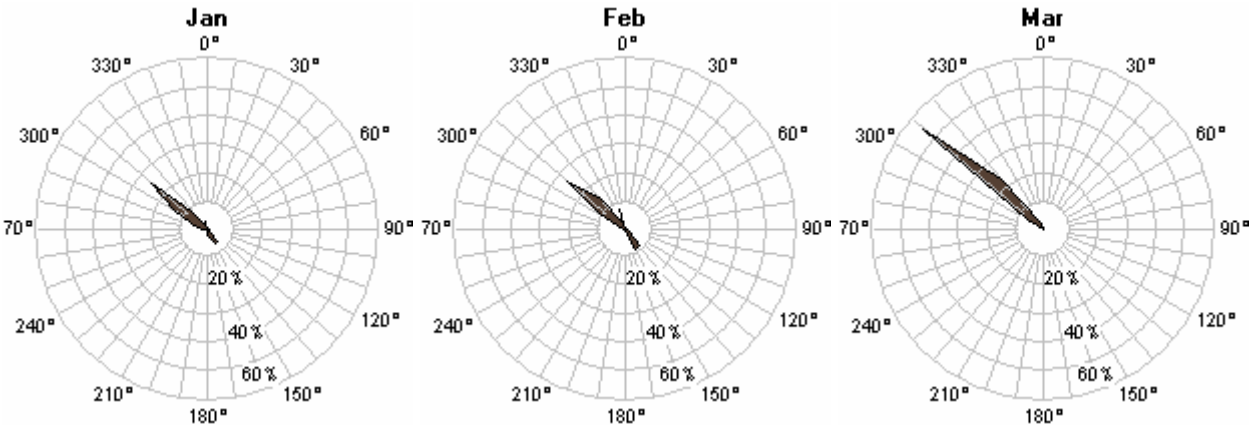
Wind frequency rose (30 meters)

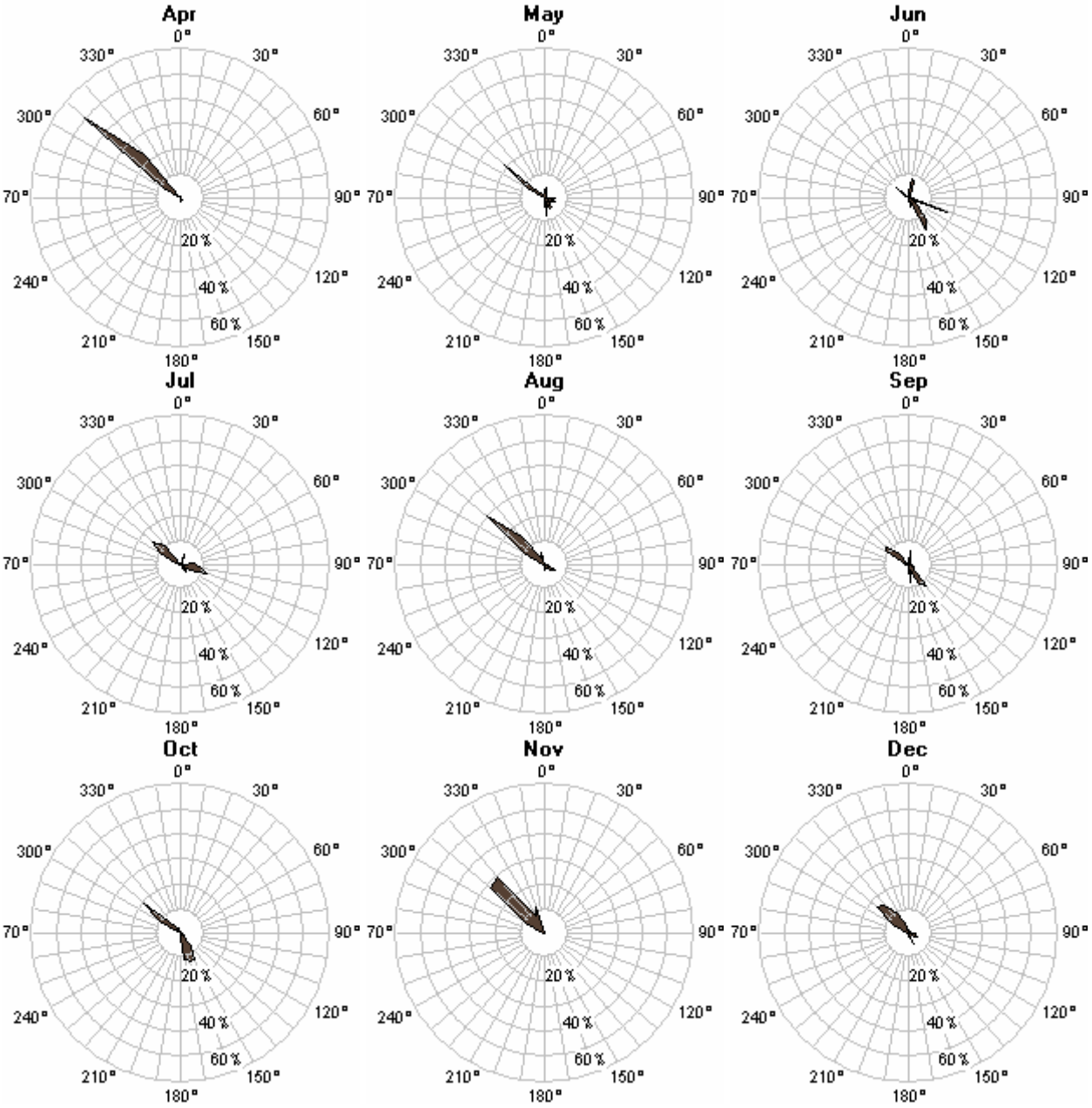


Power density rose (30 meters)



Wind Power Density Rose by Month (30 meters); note that scale is common



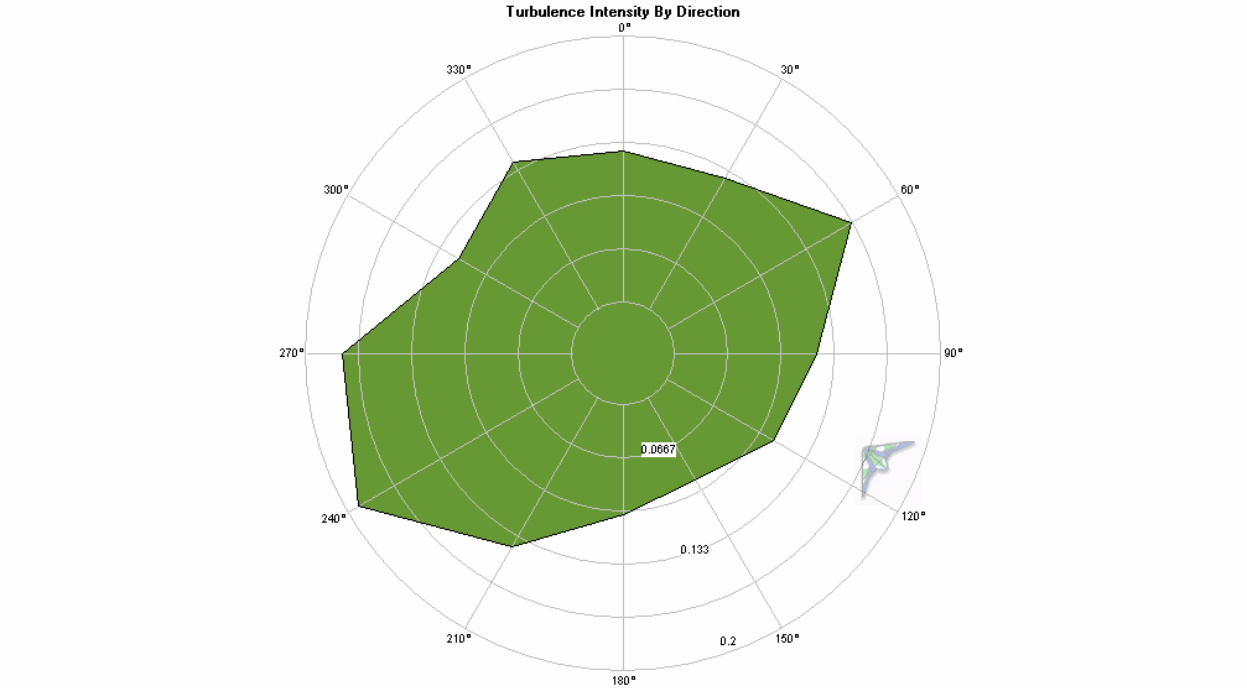

Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
0°
30°
60°
90°
120°
150°
180°
210°
240°
270°
300°
330°
20%
40%
60%

Turbulence Intensity

The Kodiak Site 1 turbulence intensity remains quite acceptable with a mean of 0.122 (A channel) and 0.129 (B channel) at 30 meters. The higher turbulence in the southwest quadrant is inconsequential as the wind almost never blows from this direction, although the turbulence intensity to the northwest, the direction of the prevailing wind, is higher than the average at approximately 0.133, also acceptable. Turbulence intensity is calculated for each time step as the standard deviation of the wind speed divided by the mean of the wind speed.

As indicated below, turbulence is well below International Energy Agency (IEA) Category A and B standards for all wind directions and at all measured wind speeds.

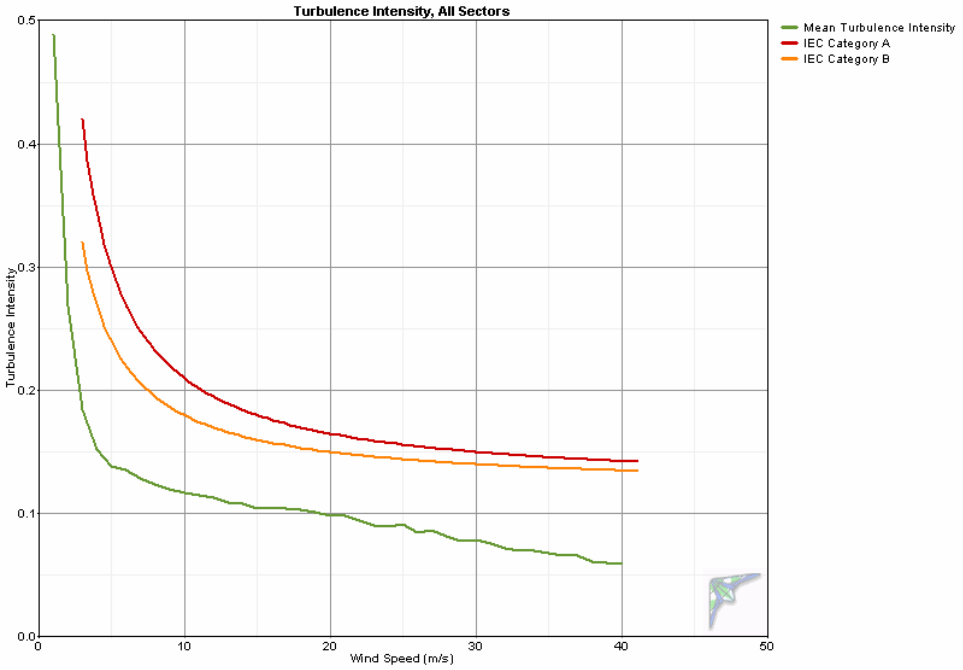
30 meter vane – 30 meter (A) Turbulence Intensity (Mean = 0.122)

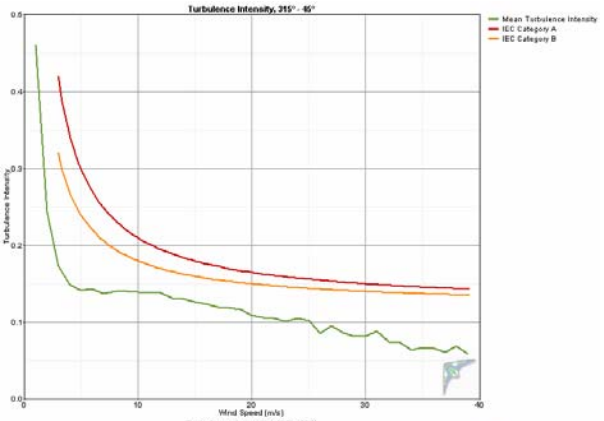


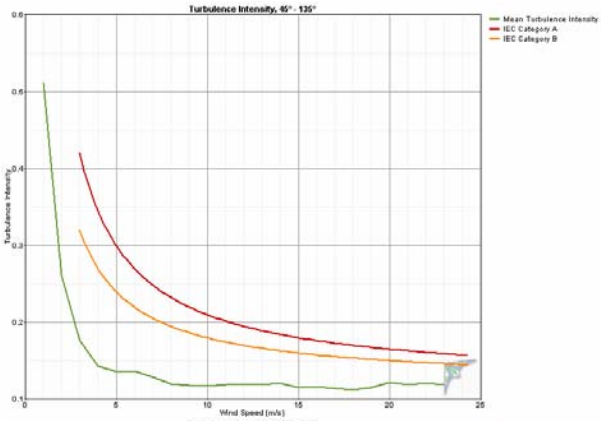
International Energy Agency turbulence standard comparisons

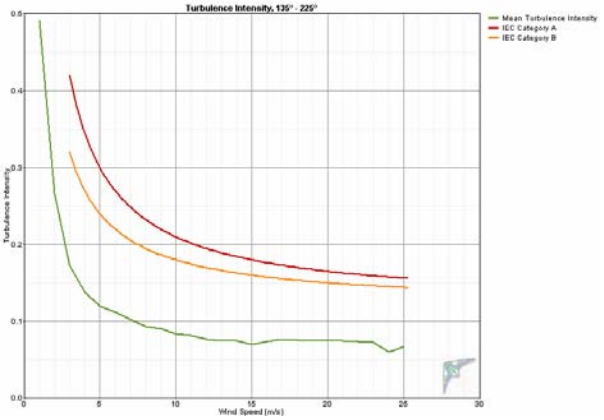
As indicated, turbulence is within International Energy Agency (IEA) Category A and B standards for all wind directions and at all measured wind speeds.

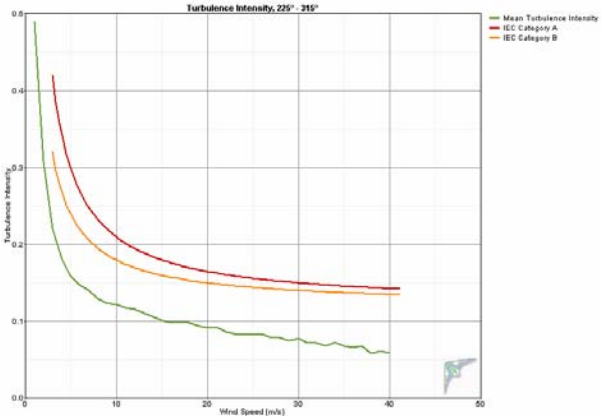
30 meter vane – 30 meter (A) speed











Turbulence Tables

30 m A speed - 30 m vane, threshold 3.5 m/s, 11/2/05 to 2/27/07

Bin Midpoint (m/s)	Bin Endpoints Lower (m/s)	Bin Endpoints Upper (m/s)	Records In Bin	Standard Deviation of Wind Speed (m/s)	Mean Turbulence Intensity	Standard Deviation of Turbulence Intensity	Characteristic Turbulence Intensity
1	0.5	1.5	4073	0.443	0.488	0.195	0.683
2	1.5	2.5	4483	0.517	0.269	0.140	0.408
3	2.5	3.5	4779	0.540	0.184	0.097	0.281
4	3.5	4.5	4852	0.600	0.152	0.077	0.229
5	4.5	5.5	5169	0.688	0.139	0.062	0.201
6	5.5	6.5	5153	0.804	0.135	0.055	0.190
7	6.5	7.5	5193	0.897	0.129	0.052	0.181
8	7.5	8.5	4761	0.985	0.124	0.047	0.171
9	8.5	9.5	4316	1.075	0.120	0.045	0.165
10	9.5	10.5	3923	1.162	0.117	0.044	0.161
11	10.5	11.5	3230	1.253	0.115	0.040	0.155
12	11.5	12.5	2860	1.351	0.113	0.040	0.153
13	12.5	13.5	2692	1.416	0.109	0.037	0.146
14	13.5	14.5	2245	1.500	0.108	0.036	0.144
15	14.5	15.5	1879	1.562	0.105	0.034	0.139
16	15.5	16.5	1546	1.672	0.105	0.034	0.139
17	16.5	17.5	1316	1.765	0.104	0.032	0.136
18	17.5	18.5	1016	1.844	0.103	0.031	0.134
19	18.5	19.5	819	1.921	0.102	0.031	0.132
20	19.5	20.5	635	1.967	0.099	0.029	0.127
21	20.5	21.5	548	2.055	0.098	0.028	0.126
22	21.5	22.5	454	2.060	0.094	0.025	0.119
23	22.5	23.5	374	2.081	0.091	0.026	0.116
24	23.5	24.5	277	2.145	0.090	0.026	0.116
25	24.5	25.5	200	2.277	0.091	0.028	0.119
26	25.5	26.5	145	2.204	0.085	0.025	0.109
27	26.5	27.5	94	2.346	0.087	0.032	0.119
28	27.5	28.5	60	2.292	0.082	0.025	0.107
29	28.5	29.5	48	2.258	0.078	0.020	0.098
30	29.5	30.5	27	2.359	0.079	0.021	0.100
31	30.5	31.5	35	2.343	0.076	0.017	0.093
32	31.5	32.5	41	2.305	0.072	0.015	0.087
33	32.5	33.5	30	2.313	0.070	0.013	0.083
34	33.5	34.5	29	2.379	0.070	0.013	0.083
35	34.5	35.5	21	2.376	0.068	0.010	0.077
36	35.5	36.5	18	2.372	0.066	0.009	0.075
37	36.5	37.5	16	2.425	0.066	0.007	0.073
38	37.5	38.5	7	2.314	0.061	0.009	0.070
39	38.5	39.5	9	2.356	0.060	0.004	0.065
40	39.5	40.5	1	2.400	0.060	0.000	0.060
41	40.5	41.5	0	2.400	0.060	0.000	0.060

30 m B speed - 30 m vane, threshold 3.5 m/s, 11/2/05 to 2/27/07

Bin Midpoint (m/s)	Bin Endpoints Lower (m/s)	Bin Endpoints Upper (m/s)	Records In Bin	Standard Deviation of Wind Speed (m/s)	Mean Turbulence Intensity	Standard Deviation of Turbulence Intensity	Characteristic Turbulence Intensity
1	0.5	1.5	4044	0.462	0.513	0.217	0.730
2	1.5	2.5	4487	0.546	0.285	0.149	0.434
3	2.5	3.5	4948	0.572	0.195	0.095	0.290
4	3.5	4.5	5045	0.651	0.165	0.080	0.246
5	4.5	5.5	5310	0.747	0.151	0.067	0.218
6	5.5	6.5	5363	0.868	0.146	0.059	0.205
7	6.5	7.5	5161	0.967	0.139	0.057	0.197
8	7.5	8.5	4630	1.043	0.131	0.053	0.184
9	8.5	9.5	4193	1.122	0.125	0.051	0.176
10	9.5	10.5	3727	1.199	0.121	0.049	0.169
11	10.5	11.5	3184	1.297	0.119	0.045	0.164
12	11.5	12.5	2868	1.388	0.116	0.043	0.160
13	12.5	13.5	2645	1.446	0.112	0.042	0.153
14	13.5	14.5	2189	1.549	0.111	0.040	0.151
15	14.5	15.5	1873	1.632	0.109	0.038	0.147
16	15.5	16.5	1509	1.682	0.106	0.034	0.140
17	16.5	17.5	1284	1.809	0.107	0.034	0.141
18	17.5	18.5	961	1.858	0.104	0.033	0.137
19	18.5	19.5	776	1.938	0.102	0.030	0.132
20	19.5	20.5	614	1.986	0.100	0.029	0.129
21	20.5	21.5	543	2.099	0.100	0.029	0.129
22	21.5	22.5	437	2.078	0.095	0.025	0.120
23	22.5	23.5	369	2.124	0.093	0.029	0.122
24	23.5	24.5	263	2.166	0.091	0.027	0.117
25	24.5	25.5	187	2.298	0.092	0.029	0.122
26	25.5	26.5	138	2.352	0.091	0.030	0.121
27	26.5	27.5	95	2.447	0.091	0.035	0.125
28	27.5	28.5	56	2.341	0.084	0.029	0.112
29	28.5	29.5	45	2.256	0.078	0.020	0.098
30	29.5	30.5	28	2.407	0.081	0.021	0.101
31	30.5	31.5	32	2.350	0.076	0.014	0.090
32	31.5	32.5	40	2.395	0.075	0.015	0.090
33	32.5	33.5	31	2.384	0.072	0.011	0.084
34	33.5	34.5	31	2.419	0.071	0.013	0.084
35	34.5	35.5	16	2.519	0.072	0.011	0.083
36	35.5	36.5	22	2.427	0.068	0.010	0.077
37	36.5	37.5	15	2.533	0.069	0.007	0.076
38	37.5	38.5	6	2.600	0.069	0.005	0.074
39	38.5	39.5	8	2.450	0.063	0.007	0.070
40	39.5	40.5	3	2.567	0.065	0.004	0.069
41	40.5	41.5	1	2.600	0.064	0.000	0.064

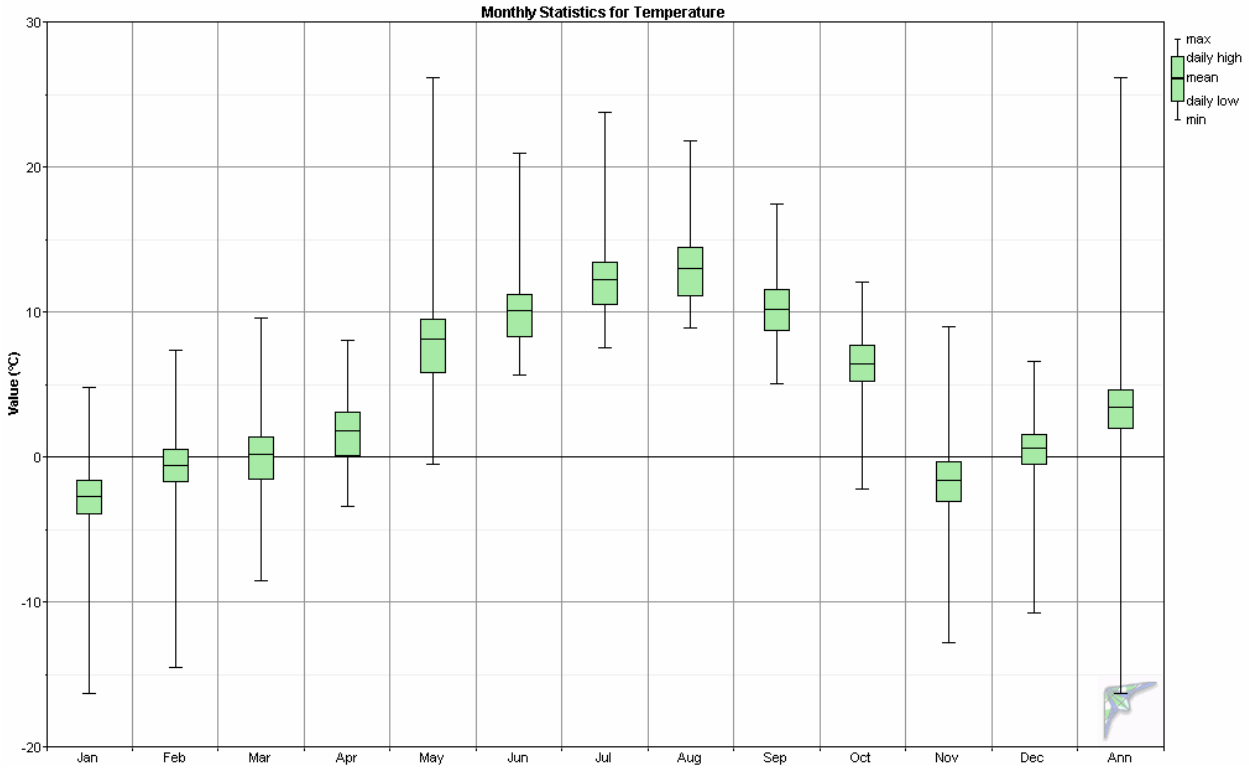
20 m speed - 30 m vane, threshold 3.5 m/s, 11/2/05 to 2/27/07

Bin Midpoint (m/s)	Bin Endpoints Lower (m/s)	Bin Endpoints Upper (m/s)	Records In Bin	Standard Deviation of Wind Speed (m/s)	Mean Turbulence Intensity	Standard Deviation of Turbulence Intensity	Characteristic Turbulence Intensity
1	0.5	1.5	3807	0.429	0.466	0.189	0.654
2	1.5	2.5	4968	0.479	0.250	0.127	0.377
3	2.5	3.5	5391	0.531	0.180	0.088	0.268
4	3.5	4.5	5562	0.622	0.157	0.071	0.228
5	4.5	5.5	5727	0.733	0.148	0.062	0.210
6	5.5	6.5	5631	0.861	0.145	0.055	0.200
7	6.5	7.5	5543	0.975	0.140	0.052	0.192
8	7.5	8.5	4924	1.074	0.135	0.049	0.184
9	8.5	9.5	4531	1.193	0.133	0.045	0.179
10	9.5	10.5	3758	1.288	0.130	0.043	0.173
11	10.5	11.5	3208	1.405	0.129	0.042	0.170
12	11.5	12.5	2736	1.511	0.127	0.041	0.168
13	12.5	13.5	2463	1.578	0.122	0.039	0.161
14	13.5	14.5	1942	1.669	0.120	0.037	0.157
15	14.5	15.5	1609	1.803	0.121	0.038	0.158
16	15.5	16.5	1273	1.899	0.119	0.035	0.154
17	16.5	17.5	1013	1.978	0.117	0.033	0.150
18	17.5	18.5	838	2.068	0.115	0.033	0.148
19	18.5	19.5	653	2.133	0.113	0.029	0.142
20	19.5	20.5	520	2.207	0.111	0.029	0.140
21	20.5	21.5	451	2.263	0.108	0.028	0.136
22	21.5	22.5	341	2.298	0.105	0.026	0.131
23	22.5	23.5	276	2.338	0.102	0.027	0.129
24	23.5	24.5	200	2.400	0.100	0.027	0.128
25	24.5	25.5	132	2.648	0.106	0.031	0.137
26	25.5	26.5	111	2.491	0.096	0.027	0.123
27	26.5	27.5	83	2.641	0.098	0.034	0.132
28	27.5	28.5	51	2.475	0.089	0.025	0.114
29	28.5	29.5	37	2.381	0.082	0.016	0.098
30	29.5	30.5	28	2.700	0.090	0.024	0.114
31	30.5	31.5	34	2.556	0.082	0.014	0.097
32	31.5	32.5	32	2.463	0.077	0.014	0.091
33	32.5	33.5	26	2.723	0.082	0.012	0.094
34	33.5	34.5	27	2.493	0.073	0.008	0.082
35	34.5	35.5	21	2.595	0.074	0.009	0.083
36	35.5	36.5	14	2.629	0.073	0.009	0.082
37	36.5	37.5	15	2.560	0.070	0.006	0.075
38	37.5	38.5	6	2.717	0.072	0.006	0.078
39	38.5	39.5	11	2.573	0.066	0.006	0.072
40	39.5	40.5	1	2.800	0.069	0.000	0.069
41	40.5	41.5	0	2.800	0.069	0.000	0.069

Air Temperature and Density

Over the reporting period, Kodiak Site 1 had an average temperature of 4.8° C. The minimum recorded temperature during the measurement period was -16.3° C and the maximum temperature was 26.2° C, indicating a cool temperate operating environment for wind turbine operations. Consequent to Kodiak's cool temperatures, but counterbalanced by Site 1's elevation of 325 meters, the average air density of 1.223 kg/m^3 is 3.0 percent higher than the standard air density of 1.187 kg/m^3 (at 12.9° C and 97.5 kPa) at this elevation. Density variance from standard is accounted for in turbine performance predictions.

	Temperature			Air Density		
Month	Mean (°C)	Min (°C)	Max (°C)	Mean (kg/m³)	Min (kg/m³)	Max (kg/m³)
Jan	-2.7	-16.3	4.8	1.256	1.222	1.322
Feb	-0.5	-14.5	7.4	1.246	1.211	1.313
Mar	0.2	-8.5	9.6	1.243	1.201	1.283
Apr	1.8	-3.4	8.1	1.235	1.208	1.259
May	8.2	-0.5	26.2	1.208	1.135	1.246
Jun	10.2	5.7	21.0	1.199	1.155	1.218
Jul	12.3	7.6	23.8	1.190	1.144	1.210
Aug	13.0	8.9	21.8	1.187	1.152	1.204
Sep	10.2	5.1	17.5	1.199	1.169	1.221
Oct	6.5	-2.2	12.1	1.215	1.191	1.254
Nov	-1.6	-12.8	9.0	1.251	1.204	1.305
Dec	0.6	-10.7	6.6	1.241	1.214	1.294
All data	**4.8**	-16.3	26.2	**1.223**	1.135	1.322



Air Density DMap

The DMap is a visual indication of the daily and seasonal variations of air density (and hence temperature). Air densities higher than standard will yield higher turbine power than predicted by turbine power curves (which are calibrated for a sea level temperature of 15° C, air pressure of 101.3 kPa, and air density of 1.225 kg/m^3, while densities lower than standard will yield lower turbine power than predicted by the power curves.